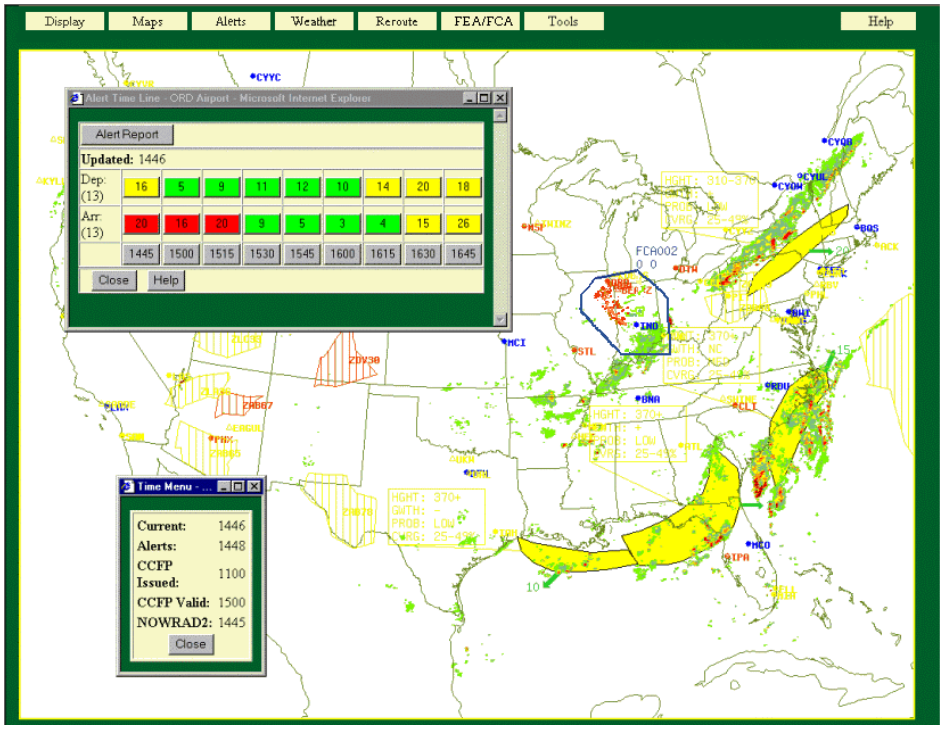
1. Welcome to the CCSD

The purpose of the Common Constraint Situation Display (CCSD) is to provide information about the National Airspace System (NAS) to those who must monitor the NAS and make decisions based on what is happening. In particular, the CCSD displays several types of dynamic data.

- Enhanced Traffic Management System (ETMS) predictions of air traffic demand for the next fifteen hours and highlights of the specific airports, sectors, and fixes where excess demand is forecast.
- Selected weather information, such as the current intensity of precipitation.
- Flow-constrained areas (FCAs), which are volumes of airspace that are expected to be special trouble spots, possibly because of severe weather.
- Reroutes that have been issued by the Air Traffic Control System Command Center (ATCSCC).
- The Collaborative Convective Forecast Product (CCFP), which provides forecasts of convective activity that look two, four, and six hours ahead.
- The National Convective Weather Forecast (NCWF), which provides a forecast of convective activity that looks one hour ahead.

In addition, to help the user interpret this data, the CCSD allows the user to display static data such as airports, navaids, fixes, and political boundaries. The following is a CCSD screen graphic that displays the following elements listed below the graphic:



- Six-level weather showing the intensity of precipitation.
- CCFP overlay showing areas where convective weather might occur.
- Alerts that show airports and sectors for which demand is predicted to exceed capacity. These alerts are highlighted in red and yellow.
- A window that shows the predicted demand at Chicago O'Hare Airport in 15-minute intervals.
- FCA drawn around convective weather in Chicago.
- Times Box showing the latest update times.

The data displayed comes from the ETMS, which is the main automation system that the FAA uses for traffic flow management. Flight data, including reports of the current positions of airborne aircraft, comes to ETMS from the twenty-one air route traffic control centers (ARTCCs) and the roughly 190 Terminal Radar Approach Control facilities (TRACONs) in the United States. In addition, data comes from Canada, Great Britain, and Mexico. ETMS receives data on flights that fly under Instrument Flight Rules (IFR).

ETMS typically receives a position update on an airborne flight once a minute. The demand predictions are updated once a minute, with these predictions being based on the latest data that ETMS has received. These predictions are provided to the CCSD. Also, the CCSD receives an update on the precipitation data and on the NCWF once every five minutes, on the CCFP once every two hours, and on FCAs and reroutes whenever an FAA traffic manager issues an update. The most recent data is shown on the CCSD every time its screen refreshes, which is once a minute (or whenever the user manually refreshes the screen).

The data shown on the CCSD is exactly the same data that is seen by the FAA traffic flow managers that use ETMS, except that data on sensitive flights such as military flights is omitted. What is notable about the CCSD is that it provides access to this data in an inexpensive and easily supported way since a CCSD user only needs a browser and connectivity to the ATCSCC, which hosts the CCSD web server.

If the CCSD is to run in a fully satisfactory way, the browser must be configured as specified in the Configuring the CCSD section in Chapter 2.

Traffic Management, ETMS, and the TSD

The role of an FAA traffic manager who uses ETMS can be explained by imagining a visit to an ARTCC, which provides en route air traffic control services. One would find two types of personnel working with screens that display flights.

First, one would see individual sector controllers performing what might be called classic or tactical air traffic control. They man individual sectors and are responsible for the flights in a specific volume of airspace defined by vertical and lateral limits. They deal in a very detailed way with individual aircraft and tell them to turn, adjust their speed, or undertake whatever other maneuvers are considered necessary to maintain a safe flow of traffic through their sector. These controllers use displays that are driven by the Host computer.

Second, working in a different part of the building one would see traffic managers. Unlike the sector controller who deals with individual aircraft, the traffic manager deals with

aggregates or flows of aircraft, especially between major airline hubs or cities. The following is an example of the type of problem that an FAA traffic manager deals with.

The ETMS predicts a hundred aircraft an hour will want to land at O'Hare Airport in Chicago, and bad weather is predicted that will reduce the capacity of the airport to 60 aircraft an hour. If no action is taken, a large number of aircraft will soon end up circling in holding patterns near Chicago waiting for an opportunity to land.

In a situation like this, to improve safety and efficiency, the FAA would prefer that those aircraft take their delays on the ground rather than in the air. Therefore, the traffic managers will use the weather forecast, the ETMS prediction of demand, and experience to decide what ground delays should be assigned to each flight so that the arriving flow of aircraft matches the airport capacity. This type of traffic management action is called a ground delay program and is typical of the duties of the traffic management personnel.

Another example of a problem that FAA traffic managers might deal with is that thunderstorms might close off routes that aircraft are scheduled to fly. Traffic managers would study the flow of aircraft and the available airspace and decide what combination of ground delays and reroutes is necessary to deal efficiently with this situation.

To help FAA traffic managers deal with traffic flow problems such as these, ETMS provides them with the data and tools they need to anticipate and alleviate problems. The Traffic Situation Display (TSD) is the main tool that FAA traffic managers use to access the ETMS data; in other words, the TSD is the main user interface to ETMS. The TSD displays a variety of data and provides numerous commands for manipulating the data as well as the display. In particular, the TSD provides a graphical display of a geographic area with overlays chosen by the user; for example, flights, weather, alert information, flow-constrained areas, reroutes, airports, sector boundaries, and navaids.

Role of the TSD, WSD, and CCSD

As mentioned above, the TSD is the main tool that FAA traffic managers use to access and display the ETMS data. It is the case, however, that not all FAA sites that need access to ETMS data have the TSD. For example, of roughly 190 TRACONs, only about 31 have the TSD. The reason is cost. The TSD is costly for the following reasons.

- The TSD runs on a high-end workstation (though the cost of the needed workstations has now dropped substantially).
- A great deal of custom ETMS software is installed on this workstation to support the TSD.
- A high level of support, both local and remote, is needed to maintain the software and hardware for ETMS workstations at each site.

Since it is too expensive to put the TSD at all sites that need access to ETMS data, the FAA has developed another display tool called the Web-based Situation Display (WSD). In short, the WSD is a tool that is very much in the spirit of the TSD in terms of look and feel and the functionality that is provided, but it is web-based and runs under a browser. This means that all a WSD site needs to get access to ETMS data is a standard browser running on a PC and connectivity to the Command Center, where the WSD server is located. The WSD has no

special hardware or software requirements. As a first approximation, the WSD provides the same functionality as the TSD, but with the following differences.

- The TSD displays a somewhat wider variety of data than the WSD. This difference will decrease as the development of the WSD continues.
- The TSD accepts a wider range of commands for manipulating this data. This difference will decrease as the development of the WSD continues.
- The TSD runs under X/Motif, which is a standard windowing environment much like Microsoft Windows; whereas, the WSD runs under a browser. In particular, this means that the WSD is somewhat slower than the TSD, and the WSD lacks some of the user convenience features of the TSD.

Although the WSD does not provide all the functionality of the TSD, it does provide the core functionality that is most needed. With the WSD a user can have access to ETMS data and can make decisions based on the data. Moreover, the WSD delivers this functionality at a much lower cost than the TSD since the WSD does not require that custom hardware and software be installed and supported at the user's site.

The WSD is aimed at not only the FAA but also at military and civilian agencies within the federal government. Any government agency interested in receiving the WSD should contact Tim Grovac, ATT-220, (703) 904-4402, tim.grovac@faa.gov.

A side benefit of the web-based approach used for the WSD is that it can easily be modified to realize the long desired goal of providing more ETMS data to the NAS users, in particular the airlines. Therefore, the FAA has developed CCSD, which is aimed at NAS users. The CCSD is, in effect, the same as the WSD except that certain data that is not appropriate for NAS users has been removed. In particular, the CCSD is the same as the WSD except for the following differences.

- The CCSD does not show flight icons since FAA policy is that showing flight icons is a function left to the private sector.
- The CCSD does not show lightning data since this data is very expensive; the NAS users are left to acquire lightning data, if desired, by other means.
- The CCSD does not show detailed data on sensitive flights, for example, military flights.

The CCSD allows the FAA to share information with the airlines, especially information about constraints in the system such as congested airports or overloaded airspace, and to collaborate in effectively solving traffic flow problems.

In short, the FAA's strategy for disseminating ETMS data is to have three platforms: TSD, WSD, and CCSD. Each platform is aimed at a different audience, depending on the performance and functionality that is required and the cost that can be justified. This strategy promises to give all personnel the data needed for making decisions at the lowest feasible cost.

User Support

For questions and comments, call the ETMS Hotline at (703) 904-4434. If you are having problems with the CCSD, please be prepared to give the Hotline operator the following information:

- The organization you are calling from.
- The URL (web address) you use to connect to the CCSD.
- The browser you are using (e.g., Netscape, Internet Explorer).